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REMARKS

Applicants' invention is based upon the discovery that by controlling the Zeta Potential of a single filter in a fluid, both positively charged and negatively charged particles can be removed from the fluid by a mechanism other than the sieving effect of the filter and other than the effect of electrostatic forces of the filter. Applicants have found that by substantially eliminating electrostatic forces between a porous membrane surface and particles in a liquid, the interaction between the particles and the membrane surface will be governed by Van der Waals forces which are always attractive. If electrostatic forces are allowed to remain, repulsive forces (negative v negative and positive v positive) will always be present, resulting in particles not being retained by the membrane. This discovery provides the substantial advantage of permitting the use of porous membranes having pores substantially larger than the particles being removed from the filtered fluid, resulting in substantially increased flow through rates as compared with membranes having smaller pores.

The Examiner's attention is called to Figs. 6 and 7 wherein removal of both negatively charged (Fig. 6) particles and positively charged (Fig. 7) particles can be removed to a level of at least 3 LRV utilizing a single filter having a Zeta Potential between about 0 and -5 millivolts. More than one filter having a Zeta Potential within this range also can be used. The results shown in Figs. 6 and 7 form the basis for applicants' claims.

Claim 11 has been rejected under 35 USC 102 as anticipated by applicants' own admission of the prior art. It is the Examiner's position that the only two data points in Fig. 5 that fall within the scope of applicants' claims are filters 2 and 3 and that filter 3 is a commercial filter not provided by the inventors. It is submitted that the Examiner's interpretation of Fig. 5 is in error. Applicants' claim limitations are: "between about 0 and about -5 millivolts" from the membrane surface and "pH about 4" from the liquid apply only to filters 2 and 6.

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Filter 3 at pH 4 has a Zeta Potential of about -9. Filters 2 and 6 are applicants' filters and Filter 3 is provided from U.S. Filter. Accordingly, Claim 11 covers only applicants' filters and excludes the prior art filters. Accordingly, this ground of rejection should be withdrawn.

Claims 11, 58-63, 69-72 have been rejected under 35 USC 102 or 35 USC 103 over Pall et al (US 4,431,545). It is the Examiner's position that Pall '545 teaches filtering "fluid containing charged particles through filters having a nominal pore size between 0.2 and 10 microns and having a Zeta Potential between 0 and -5mV based on:

abstract, col. 1, lines 15-24,
col. 2, lines 20-27,
col. 3, lines 25 and col. 4, line 15.

The claims have been amended to define "a substantially neutral" membrane surface as "having a Zeta Potential between about 0 and about -5 millivolts". This amended claim language is based on the filtration results shown in Figs. 6 and 7 and which are within the scope of applicants' original specification and drawings. As shown in Figs. 6 and 7 only filters 1 and 6 remove both negatively charged and positively charged particles to an LRV of at least 3 under the specified filtration conditions of pH. Both of these filters are provided by applicants and are not filters of the prior art.

Pall '545 does not specify the Zeta Potential of the membranes they use in their filtration process, only that membranes having a Zeta Potential above 20 mV are to be avoided (Col. 2, line 21). Also, in contrast to applicants', Pall ('545) requires the use of two filters for filtering a fluid containing particles. Pall ('545) requires a filter having a positive zeta potential in conjunction with a filter having a negative zeta potential. Applicants have discovered that only one or more filters, each having a zeta potential between 0 and -5 mV are useful for removing both positively charged particles and negatively charged particles in the desired

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LRV level. This discovery is not suggested by Pall et al ('545). Accordingly, this ground of rejection should be withdrawn.

Claims 64, 65 and 75-77 have been rejected under 35 USC 103(a) over Pall et al ('545) in view of Mayhan (US 4,311,573). Pall et al ('545) is discussed above. It is the Examiner's position that Mayhem teaches surface modifications of filters and that it would be obvious to so-modify the Pall et al ('545) membranes. Mayhan does not supply the deficiencies of Pall et al ('545) in that there is no suggestion of using one or more membranes each having a Zeta Potential with the 0 to -5 millivolt range. Accordingly, this ground of rejection should be withdrawn.

Claims 66 and 68 have been rejected under 35 USC 103(a) over Pall et al ('545) in view of McKay (US 5,582,728). It is the Examiner's position that Pall et al ('545) does not disclose ceramics or metals as filter media but that McRay does. McRay does not supply the deficiencies of Pall et al ('545) in that McRay contains no suggestion of using one or more membranes each having a Zeta Potential with the 0 to -5 millivolt range. Accordingly, this ground of rejection should be withdrawn.

Claim 67 has been rejected under 35 USC 103(a) over "Pall ('124)" in view of Pall (US 4,430,479). It appears that "Pall ('124)" should read "Pall ('545)". It is the Examiner's position that Pall et al ('545) does not disclose cellulosic materials for the filter but that Pall ('479) teaches such cellulosic filter. Pall et al ('479) does not supply the deficiencies of Pall et al ('124) in that there is no suggestion of using one or more membranes each having a Zeta Potential within the 0 to -5 millivolt range. Accordingly, this ground of rejection should be withdrawn.

Claim 73 has been rejected under 35 USC 103(a) over Pall et al ('545) in view of Pall et al ('124). It is the Examiner's position that Pall et al ('545) teaches all the claim limitation except the use of monomers such as acrylamide but that


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Pall et al ('124) teaches acrylamide. Pall et al ('124) does not supply the deficiencies of Pall ('545) in that there is no suggestion of using one or more membranes each having a Zeta Potential with the 0 to -5 millivolt range.

In view of the above, it is submitted that Applicants' claims define patentable subject matter and an early Notice of Allowance is respectfully requested.

Respectfully submitted.

By 

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